

What is claimed is:

sub 1 A lens barrier opening/closing device of a movable lens barrel driven to move between an accommodation position and a photographing position, comprising:

at least one barrier blade which is driven to open and close a photographic aperture formed at the front end wall of said movable lens barrel when said movable lens barrel is in said photographing position and said accommodation position, respectively;

a barrier drive ring driven to rotate about an optical axis to drive said barrier blade;

a first biasing device which biases said barrier drive ring in a predetermined rotational direction;

15 a rotational barrel which at least rotates about said optical axis when said movable lens barrel moves between said accommodation position and said photographing position;

a rotational-force receiving surface formed on said barrier drive ring, said rotational-force receiving surface extending parallel to said optical axis; and

a rotational-force transmission surface formed on said rotational barrel, said rotational-force transmission surface extending parallel to said optical axis,

wherein said rotational-force receiving surface and said rotational-force transmission surface are engaged with each other to rotate said barrier drive ring together with said rotational barrel about said optical axis in a direction against a biasing force of said first biasing device when said movable lens barrel moves from one of said photographing position and said accommodation position to the other of said photographing position and said accommodation position.

10 2. The lens barrier opening/closing device according to claim 1, wherein said barrier drive ring comprises a drive lever which extends substantially parallel to the optical axis toward said rotational barrel, said drive lever including said rotational-force
15 receiving surface thereon.

 3. The lens barrier opening/closing device according to claim 2, wherein said rotational barrel comprises a recess formed to allow said drive lever to enter said recess, said rotational-force transmission
20 surface being formed as a wall of said recess.

 4. The lens barrier opening/closing device according to claim 1, wherein said movable lens barrel is an element of a zoom lens of a camera.

 5. The lens barrier opening/closing device
25 according to claim 1, wherein said first biasing device

comprises at least one helical extension spring.

6. The lens barrier opening/closing device according to claim 1, wherein said barrier drive ring and said rotational barrel rotate relative to each other about
5 said optical axis and move relative to each other in a direction of said optical axis when said movable lens barrel moves between said photographing position and said accommodation position, and

wherein said barrier drive ring and said rotational
10 barrel are apart from each other so that said rotational-force receiving surface and said rotational-force transmission surface do not overlap each other in said direction of said optical axis when said movable lens barrel is in a specific one of said
15 photographing position and said accommodation position in which said rotational barrel does not drive said barrier drive ring to rotate about said optical axis via said rotational-force receiving surface and said rotational-force transmission surface.

20 7. The lens barrier opening/closing device according to claim 6, further comprising:

a linearly movable barrel positioned around said rotational barrel, guided in said direction of said optical axis without rotating about said optical axis, and
25 supporting said barrier drive ring in a front end of said

linearly movable barrel so that said barrier drive ring is rotatable about said optical axis;

a radially inward pin formed on said linearly movable barrel to extend radially inwards; and

5 a guide groove, corresponding to said radially inward pin, formed on an outer peripheral surface of said rotational barrel to be engaged with said radially inward pin to move said linearly movable barrel in said direction of said optical axis by rotation of said rotational barrel.

10 8. The lens barrier opening/closing device according to claim 7, wherein said movable lens barrel is an element of a zoom lens of a camera, and

wherein said linearly movable barrel functions as a movable lens hood which advances relative to said rotational barrel when said zoom lens is set at a telephoto extremity thereof having a narrow angle of view, and which retreats relative to the rotational barrel when said zoom lens is set at a wide-angle extremity thereof having a wide angle of view.

20 9. The lens barrier opening/closing device according to claim 1, further comprising:

a second biasing device which biases said barrier blade in a direction toward one of an open position and a closed position of said barrier blade against the biasing force of said first biasing device, a biasing force of said

second biasing device being smaller than that of said first biasing device,

wherein said barrier blade is driven by said biasing force of said second biasing device when said barrier drive ring is driven to rotate against said biasing force of said first biasing device by rotation of said rotational barrel.

10. The lens barrier opening/closing device according to claim 9, wherein said second biasing device comprises at least one torsion spring.

11. A lens barrier opening/closing device of a movable lens barrel, comprising:

at least one barrier blade which is driven to open and close a photographic aperture formed at the front end wall of said movable lens barrel;

a rotational barrel which at least rotates about an optical axis when said movable lens barrel moves between an accommodation position and a photographing position;

a barrier drive ring driven to rotate about said optical axis to drive said barrier blade;

an opening biasing device which biases said barrier drive ring in a direction to open said barrier blade;

a rotational-force receiving surface formed on said barrier drive ring, said rotational-force receiving surface extending parallel to said optical axis; and

a rotational-force transmission surface formed on said rotational barrel, said rotational-force transmission surface extending parallel to said optical axis,

5 wherein said rotational-force receiving surface and said rotational-force transmission surface are engaged with each other to rotate said barrier drive ring about said optical axis in a direction to close said barrier blade against said biasing force of said opening biasing
10 device while said rotational barrel rotates when said movable lens barrel moves from said photographing position to said accommodation position.

12. The lens barrier opening/closing device according to claim 11, further comprising a linearly
15 movable barrel guided in a direction of said optical axis without rotating about said optical axis, said linearly movable barrel supporting said barrier drive ring at a front end thereof so that said barrier drive ring is rotatable about said optical axis.

20 13. The lens barrier opening/closing device according to claim 11, further comprising:

at least one engaging portion formed on said barrier drive ring to be engageable with said barrier blade; and

a closing biasing device which biases said barrier
25 blade in a direction to close said photographic aperture,

a biasing force of said closing biasing device being smaller than that of said opening biasing device,

wherein said engaging portion of said barrier drive ring held at a position to open said barrier blade by said
5 biasing force of said opening biasing device pushes said barrier blade to open said barrier blade when said movable lens barrel is in said photographing position, and

wherein said engaging portion is disengaged from said barrier blade so that said barrier blade is driven
10 to be closed by said biasing force of said closing biasing device when said barrier drive ring is driven to rotate about said optical axis against said biasing force of said opening biasing device by rotation of said rotational barrel when said movable lens barrel moves from said
15 photographing position to said accommodation position.

14. A camera comprising:

a movable lens barrel driven to move between a photographing position an accommodation position when the power of said camera is turned ON and OFF, respectively;

20 at least one barrier blade driven to open and close a photographic aperture formed at the front of said movable lens barrel when said movable lens barrel is in said photographing position and said accommodation position, respectively;

25 a barrier drive ring driven to rotate about an

optical axis to drive said at least one barrier blade;

at least one spring which biases said barrier drive ring in a direction to open said barrier blade;

a rotational barrel which rotates about said optical axis when said movable lens barrel moves between said accommodation position and said photographing position;

a lever formed on said barrier drive ring to extend toward said rotational barrel, said lever including a first engaging surface extending parallel to said optical axis; and

a recess formed on said rotational barrel so that said lever can enter said recess in a direction of said optical axis, said recess including a second engaging surface extending parallel to said optical axis,

wherein said first engaging surface and said second engaging surface are engaged with each other to rotate said barrier drive ring about said optical axis in a direction to close said barrier blade against said biasing force of said biasing device when said movable lens barrel moves from said photographing position to said accommodation position.

15. A lens barrier opening/closing device of a movable lens barrel driven to move between an accommodation position and a photographing position, comprising:

at least one barrier blade which is driven to open and close a photographic aperture formed at the front end wall of said movable lens barrel when said movable lens barrel is in said photographing position and said accommodation position, respectively;

a linearly movable barrel guided in a direction of an optical axis without rotating about said optical axis;

a barrier drive ring driven to rotate about said optical axis to drive said barrier blade, said linearly movable barrel supporting said barrier drive ring in a front end of said linearly movable barrel to be rotatable about said optical axis; and

a pair of ring biasing springs positioned between said barrier drive ring and said linearly movable barrel on opposite sides with respect to said optical axis in a radial direction to bias said barrier drive ring in a predetermined rotational direction,

wherein said barrier drive ring is driven to rotate in a rotational direction opposite to said predetermined rotational direction against a biasing force of said pair of ring biasing springs by a movement of a movable member provided in said lens barrel when said movable lens barrel moves from one of said photographing position and said accommodation position to the other of said photographing position and said accommodation position.

16. The lens barrier opening/closing device according to claim 15, further comprising:

at least one barrier biasing spring which biases said barrier blade in a direction opposite to a biasing
5 direction of said pair of ring biasing springs toward one of an open position and a closed position of said barrier blade,

wherein a biasing force of said barrier biasing spring is smaller than that of said pair of ring biasing
10 springs, and

wherein said barrier blade is driven by said biasing force of said barrier biasing spring to move to one of said open position and said closed position when said barrier drive ring is driven to rotate against said biasing force
15 of said pair of ring biasing springs.

17. The lens barrier opening/closing device according to claim 16, wherein said at least one barrier blade comprises at least one pair of barrier blades,

wherein said at least one barrier biasing spring
20 comprises a pair of barrier biasing springs positioned on opposite sides with respect to said optical axis in said radial direction of said at least one pair of barrier blades in a radial direction to bias each of said at least one pair of barrier blades toward one of said open position
25 and said closed position,

wherein said barrier drive ring comprises at least one pair of engaging portions which can be engaged with said at least one pair of barrier blades, respectively,

wherein said barrier drive ring is engaged with at least one pair of said barrier blades to push said at least one pair of barrier blades via said at least one pair of engaging portions against a biasing force of said pair of barrier biasing springs when driven to rotate about said optical axis in said predetermined rotational direction, and

wherein said barrier drive ring is disengaged from said at least one pair of barrier blades when driven to rotate about the optical axis against a biasing force of said pair of ring biasing springs via said movement of said movable member.

18. The lens barrier opening/closing device according to claim 15, wherein said linearly movable barrel comprises a pair of first protrusions positioned on opposite sides with respect to said optical axis in said radial direction,

wherein said barrier drive ring comprises a pair of second protrusions positioned on opposite sides with respect to said optical axis in said radial direction,

wherein said pair of ring biasing springs are formed as two helical extension springs, and

wherein the opposite ends of one of said two helical extension springs are connected to one of said pair of first protrusions and one of said pair of second protrusions, respectively, while the opposite ends of the other of said two helical extension springs are connected to the other of said pair of first protrusions and the other of said pair of second protrusions, respectively.

19. The lens barrier opening/closing device according to claim 15, wherein said pair of ring biasing springs bias said barrier drive ring in a first rotational direction to drive said barrier blade to open said photographic aperture, and

wherein said barrier drive ring is driven to rotate in a second rotational direction opposite to said first rotational direction to drive said barrier blade to close said photographic aperture when said movable lens barrel moves from said photographing position to said accommodation position.

20. The lens barrier opening/closing device according to claim 15, wherein said barrier biasing spring comprises at least one torsion spring.

21. The lens barrier opening/closing device according to claim 15, wherein said movable lens barrel is an element of a zoom lens of a camera.

22. The lens barrier opening/closing device

according to claim 21, wherein said linearly movable barrel functions as a movable lens hood which advances relative to said rotational barrel when said zoom lens is set at a telephoto extremity thereof having a narrow angle of view, and which retreats relative to the rotational barrel when said zoom lens is set at a wide-angle extremity thereof having a wide angle of view.

23. A camera comprising:

a movable lens barrel driven to move between a photographing position an accommodation position when the power of said camera is turned ON and OFF, respectively;

at least one barrier blade driven to open and close a photographic aperture formed at the front of said movable lens barrel when said movable lens barrel is in said photographing position and said accommodation position, respectively;

a linearly movable barrel guided in a direction of an optical axis without rotating about said optical axis;

a barrier drive ring driven to rotate about said optical axis to drive said barrier blade, said linearly movable barrel supporting said barrier drive ring in a front end thereof so that said barrier drive ring is rotatable about said optical axis;

a rotational barrel which rotates about said optical axis when said movable lens barrel moves between said

accommodation position and said photographing position;
and

a pair of springs positioned between said barrier
drive ring and said linearly movable barrel on opposite
5 sides, with respect to said optical axis in a radial
direction, to bias said barrier drive ring in a
predetermined rotational direction,

wherein said barrier drive ring is driven to rotate
in a rotational direction opposite to said biased
10 rotational direction by rotation of said rotational barrel
when said movable lens barrel moves from one of said
photographing position and said accommodation position to
the other of said photographing position and said
accommodation position.

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